

REMARKS

Claims 86-88, 90-162, 224-227, 270-272, 287, and 288 are pending in the subject application. Claims 140-150, 159-162, 224-227, and 270 have been withdrawn from consideration. In the present Office Action, claims 86-88, 90-139, 287, and 288 stand rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent Nos. 5,945,491 or 6,111,022 Matyjaszewski et al. ("the '491 patent" and "the '022 patent", collectively "the Matyjaszewski patents"). Claims 151-158 and 271-272 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the '491 patent in view of Patten et al., "Atom Transfer Radical Polymerization and the Synthesis of Polymeric Materials," Advanced Materials 1998, 10(12), 901-915 ("Patten"). Applicants respectfully traverse the rejection of claims 86-88, 90-139, 151-158, 271-272, and 287-288 as set forth herein.

Claims 114, 151, and 271 have been amended in the present response to correct minor typographical errors or to establish correct antecedent basis. These amendments place the application in condition for allowance. No new subject matter is added by these amendments. Applicants respectfully request that the Examiner enter these amendments.

Rejection under 35 U.S.C. § 102(e)

Claims 86-88, 90-139, 287, and 288 stand rejected under 35 U.S.C. §102(e) as being anticipated by the Matyjaszewski patents. Applicants traverse this rejection as set forth herein.

In Applicants' amendments and arguments filed November 6, 2006, Applicants amended independent claims 86 to include the limitation that the second compound is not a free radically polymerizable monomer and argued that the process of amended Claim 86 is different than the disclosure of the Matyjaszewski patents because the process requires that the second compound not be a radically polymerizable monomer, whereas, all of the compounds in the Matyjaszewski patents at Scheme 3 added in the atom transfer radical polymerization ("ATRP") steps are radically polymerizable monomers.

In the present Office Action, the Examiner asserts that in Example 5, Experiment 4 of the Matyjaszewski patents, Table 5 shows the use of α -methyl vinyl methyl ketone as a second compound in an ATRP reaction. The Examiner further states that he could not find any polymer prepared from α -methyl vinyl methyl ketone in a literature search and therefore the α -methyl vinyl methyl ketone corresponds to a second compound that is not a free radically polymerizable monomer.

Applicants respectfully point out that the α -methyl vinyl methyl ketone shown in Table 5 of the Matyjaszewski patents is the result of a misprint and the compound actually used in Experiment 4 of Example 5 was methyl methacrylate, a common free radically polymerizable monomer. Example 5 illustrates the preparation of an A-B-A block copolymer "in an atom transfer radical polymerization using styrene, methyl acrylate or methyl methacrylate as monomers. Table 5 summarizes representative polymerization results for cationic polymerization of styrene (exp. 1), and a homogeneous ATRP of styrene (St) (exp. 2), methyl acrylate (MA) (exp. 3) and methyl methacrylate (MMA) (exp. 4)." (The '491 patent at column 30, lines 32-65 and the '022 patent at column 30, lines 36-55, emphasis added). Based on text of Example 5, one having ordinary skill in the art would understand that structure of the monomer in Table 5 for Experiment 4 is missing the subscript "2" after the oxygen and should read " $\text{CH}_2=\text{CCH}_3(\text{CO}_2\text{Me})$ " (i.e. methyl methacrylate). Thus, the text cited by the Examiner discloses the polymerization of methyl methacrylate via an ATRP process and not a polymerization using α -methyl vinyl methyl ketone.

"To anticipate, [a] reference must also enable one of skill in the art to make and use the claimed invention." (*In re Donohue*, 766 F.2d 531, 533, 226 USPQ 619, 621 (Fed. Cir. 1985), see also MPEP §2121.01). Applicants respectfully assert that the disclosure of the Matyjaszewski patents is not enabling for the use of α -methyl vinyl methyl ketone in an ATRP process because the disclosure of α -methyl vinyl methyl ketone is the result of a misprint. One having ordinary skill in the polymer chemistry would understand that the structure in Experiment 4, Table 5 is incorrect and that the correct monomer was methyl methacrylate as recited in the experimental write-up. The Matyjaszewski patents do not disclose or enable the use α -methyl vinyl methyl ketone

as a non-radically polymerizable monomer in a polymerization reaction. Therefore, the Matyjaszewski patents do not anticipate the claims of the subject application. Applicants respectfully request the rejection under 35 U.S.C. § 102(e) be withdrawn.

Rejections under 35 U.S.C. § 103(a)

Claims 151-158 and 271-272 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the '491 patent in view of Patten. Applicants traverse this rejection as set forth herein.

To establish a case for *prima facie* obviousness, three basic criteria must be met: a) there must be some suggestion or motivation to modify the reference or to combine the reference teachings; b) there must be a reasonable expectation of success; and c) the prior art reference(s) must teach or suggest all the claim limitations. MPEP 2143. Applicants submit that *prima facie* obviousness has not been established for at least the reasons that the cited prior art reference does not teach or suggest all the claim limitations and there is no suggestion or motivation to modify the reference.

Claims 151-158 of the subject application are drawn to a controlled polymerization process, comprising: adding a core forming compound to an active atom transfer radical polymerization process; and forming a multi-arm star copolymer wherein polymers react with the core forming compound to form the multi-arm star copolymer. Claims 271-272 of the subject application are drawn to a controlled polymerization process for the production of telefunctional multi-arm star copolymers, comprising: polymerizing a free radically (co)polymerizable monomer in the presence of a system comprising: a telefunctional multi-armed star initiator synthesized from free radically copolymerizable monomers, a first initiator with one radically transferable atom or group, and a divinyl compound.

The '491 patent discloses an ATRP process comprising polymerizing one or more radically (co)polymerizable monomers in the presence of a system comprising: a macroinitiator, a transition metal-complex, and one or more N-, O-, or S-containing ligand, to form a polymer. (See, claim 1 of the '491 patent). The polymerization process of the '491 patent comprises activation of an initial monomer or macroinitiator by the transition metal-complex/ligand followed by addition of a second monomer to

give a dimer, followed by addition of a third monomer to give a trimer, etc., in a repeating process that results in a polymer. Between each monomer addition step, the resulting growing macromolecule can be deactivated and reactivated to control the living polymerization. (The '491 patent, schemes 3 and 5, and column 23, line 66 to column 24, line 19). Using the '491 patent process, hyperbranched polymers can be grown by adding monomers to an initiator or macroinitiator.

The Patten article also discloses an ATRP process for the production of polymers. Like the '491 patent, the Patten disclosure teaches a chain-growth polymerization (i.e., a polymerization process in which the monomers are added first to the initiator and then subsequently to the growing polymer chain). (See, Patten, scheme 3 and related text, on page 904). Patten discloses the formation of hyperbranched polymers via the ATRP process (i.e., addition of monomer units to the growing branches, page 913) and also indicates that star polymers can be prepared by controlled living ATRP by controlled addition of monomer units during chain growth. (See, Introduction and Figure 1, page 901).

Unlike the '491 patent and the Patten article, the claims of the subject application disclose adding a core forming compound to an active atom transfer radical polymerization process; and forming a multi-arm star copolymer wherein polymers react with the core forming compound to form the multi-arm star copolymer. This is a fundamentally different process than the chain growth polymerization processes of the '491 patent and Patten. The claimed process involves reacting the already formed polymers with the core forming compound to form the multi-arm star copolymer (i.e., adding the formed polymer arms to the core of the star copolymer) in an atom transfer linking reaction. (See, page 24, line 28 to page 25, line 27 of the specification as filed and Figure 7 for a discussion of this process). The ATRP processes disclosed in the '491 patent or Patten involve chain growth polymerization from an initiator (i.e., step-wise growing the arms – monomer by monomer – from the core initiator of the star polymer). Neither the '491 patent nor Patten disclose or suggest the step of "forming a multi-arm star copolymer wherein polymers react with the core forming compound". Further, neither reference discloses a system comprising a telefunctional multi-armed

star initiator and a divinyl compound. Therefore, the cited references do not teach or suggest each and every element of the claim.

Further, one having ordinary skill in the art would not be motivated by the disclosure of the '491 patent or Patten to form a multi-arm star copolymer by a process wherein polymers react with the core forming compound. All ATRP processes disclosed in the cited references involve chain growth formation of the polymer by addition of the monomer units to the initiator or growing polymer. There is no disclosure of forming a polymer topology by reacting polymers with a core forming compound, such as a divinyl compound.

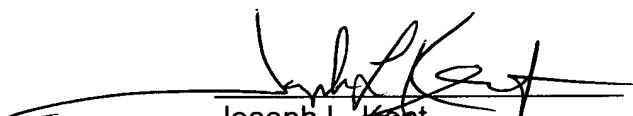
Prima facie obviousness has not been established. Applicants respectfully request that the rejection of claims 151-158 and 271-272 under 35 U.S.C. § 103(a) be withdrawn.

CONCLUSION

Applicants submit that claims 86-88, 90-139, 151-158, 271-272, and 287-288 of the subject application recite novel and non-obvious processes for forming polymers. Applicants respectfully request that the Examiner consider the Amendments and Remarks submitted herein and Applicants respectfully submit that all claims in the subject application are in condition for allowance. Accordingly, reconsideration of the rejection and allowance of all pending claims is earnestly solicited.

If the undersigned can be of assistance to the Examiner in addressing issues to advance the application to allowance, please contact the undersigned at the number set forth below.

Respectfully submitted,



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